Abstract:

Due to its ability to handle nonlinear functions regardless of the derivatives information, evolutionary algorithms (EA) are envisaged to be very effective for extracting parameter of photovoltaic (PV) cell. This paper presents critical evaluation of the parameters extraction of two diode PV model using three EA methods, namely Genetic Algorithm (GA), Particle Swarm Optimization (PSO) and Differential Evolution (DE). For DE, two variations are proposed: (1) boundary based differential evolution (B-DE) and (2) penalty based differential evolution (P-DE). The performance of each method is evaluated based on several factors: accuracy and consistency of solution; speed of convergence; computational efficiency and the required number of control parameters. Comparisons are carried out using synthetic data and are validated by six PV modules of different types (multi-crystalline, mono-crystalline, and thin-film) from various manufacturers. Information derived from these critical evaluations can be useful to determine the best computational method to build an efficient and accurate PV system simulator.